CLAIMS

1. A plurality of ceramic elements secured to each other by at least a first band of a kinetic spray applied material.

2. The plurality of ceramic elements as recited in claim 1, wherein said elements are arranged in a stack and said first band is applied along an edge of said stack.

3. The plurality of ceramic elements as recited in claim 1, wherein said first band is formed from an electrically conductive material.

4. The plurality of ceramic elements as recited in claim 3, wherein said electrically conductive material comprises copper, a copper alloy, nickel, a nickel alloy, aluminum, an aluminum alloy, a stainless steel, and mixtures of these materials.

5. The plurality of ceramic elements as recited in claim 1, wherein said first band is formed from powders having nominal average particle sizes of from 60 to 106 microns.

6. The plurality of ceramic elements as recited in claim 1 including at least a first ceramic element and a second ceramic element, said first and second ceramic elements each having an electrically conductive region and said first band electrically coupling said electrically conductive region of said first ceramic element to said electrically conductive region of said second ceramic element.

7. The plurality of ceramic elements as recited in claim 1 further including at least said first band and at least a second band of a kinetic spray applied material, said second band also securing said ceramic elements to each other.

8. The plurality of ceramic elements as recited in claim 1, wherein said first band has a thickness of from 1 millimeter to 2.5 centimeters.

9. The plurality of ceramic elements as recited in claim 1, further comprising an outer layer applied over said first band, said outer layer comprising of one of a kinetic spray applied layer of tantalum or a thermal spray applied layer of a ceramic.

10. The plurality of ceramic elements as recited in claim 9, wherein said outer layer has a thickness of from 20 microns to 1 millimeter.

11. The plurality of ceramic elements as recited in claim 1, further including one of an electrically conductive wire or an electrically conductive ribbon embedded in said first band.

12. A non-thermal plasma reactor comprising a plurality of ceramic elements arranged in a stack, said stack including at least a first plurality of ceramic elements and a second plurality of ceramic elements;

said first plurality of ceramic elements each having a ground electrode with a connector, said second plurality of ceramic elements each having a charge electrode with a connector;

a first band of an electrically conductive material applied by a kinetic spray process and electrically coupling the connectors of the ground electrodes and a second band of an electrically conductive material applied by a kinetic spray process and electrically coupling the connectors of the charge electrodes; and

said first and second bands securing said plurality of ceramic elements together.

13. The non-thermal plasma reactor as recited in claim 12 wherein said electrically conductive material comprises copper, a copper alloy, nickel, a nickel alloy, aluminum, an aluminum alloy, a stainless steel, and mixtures of these materials.

14. The non-thermal plasma reactor as recited in claim 12, wherein said first and second bands are formed from powders having nominal average particle sizes of from 60 to 106 microns.

15. The non-thermal plasma reactor as recited in claim 12 wherein said first and second bands each have a thickness of from 1 millimeter to 2.5 centimeters.

16. The non-thermal plasma reactor as recited in claim 12 wherein an outer layer is applied over each of said first and second bands, said outer layers comprising of one of a kinetic spray applied layer of tantalum or a thermal spray applied layer of a ceramic.

17. The non-thermal plasma reactor as recited in claim 16, wherein said outer layers each have a thickness of from 20 microns to 1 millimeter.

18. The non-thermal plasma reactor as recited in claim 12 further including one of an electrically conductive wire or an electrically conductive ribbon embedded in said first and second bands.

19. A method of securing a plurality of ceramic elements to each other comprising the steps of

a) providing particles of a material to be sprayed;

b) providing a supersonic nozzle;

c) providing a plurality of ceramic elements releasably held together and positioned opposite the nozzle;

d) directing a flow of a gas through the nozzle, the gas having a temperature of from 600 to 1200 degrees Fahrenheit; and

e) entraining the particles in the flow of the gas and accelerating the particles to a velocity sufficient to result in adherence of the particles to the ceramic elements upon impact, thereby forming at least a first band of adhered material on the ceramic elements and securing the ceramic elements together.

20. The method of claim 19, wherein step a) comprises providing particles having an average nominal diameter of from 60 to 106 microns.

21. The method of claim 19, wherein step b) comprises providing a nozzle having a throat with a diameter of from 1.5 to 3.0 millimeters.

22. The method of claim 19, wherein step a) comprises providing particles comprising an electrically conductive material.

23. The method of claim 22, wherein step a) comprises providing copper, a copper alloy, nickel, a nickel alloy, aluminum, an aluminum alloy, a stainless steel, and mixtures of these materials as the electrically conductive material.

24. The method of claim 19, wherein step e) comprises forming a band having a thickness of from 1 millimeter to 2.5 centimeters.

25. The method of claim 19, wherein step e) comprises forming a plurality of bands.

26. The method of claim 19, wherein step e) comprises directing the particles at the ceramic elements at an angle of from 0 to 45 degrees relative to a line drawn normal to the ceramic elements.

27. The method of claim 19, wherein step e) comprises directing the particles at the ceramic elements at an angle of from 15 to 25 degrees relative to a line drawn normal to the ceramic elements.

28. The method of claim 19, wherein step e) comprises moving one of the plurality ceramic elements or the nozzle past the other at a speed of from 0.5 to 13 centimeters per second.

29. The method of claim 19, wherein step e) comprises moving one of the plurality ceramic elements or the nozzle past the other at a speed of from 0.5 to 6.5 centimeters per second.

30. The method of claim 19, wherein step c) comprises positioning the plurality of ceramic elements opposite the nozzle at a distance of from 10 to 40 millimeters.

31. The method of claim 19, wherein step c) comprises positioning the plurality of ceramic elements opposite the nozzle at a distance of from 10 to 20 millimeters.

32. The method of claim 19, further comprising after step e) the step of applying an outer layer over the band, the outer layer comprising one of tantalum or a ceramic.

33. The method of claim 19, wherein step e) further comprises embedding one of an electrically conductive wire or electrically conductive ribbon in the first band.

34. A method of forming a non-thermal plasma reactor comprising the steps of

a) providing particles of an electrically conductive material to be sprayed;

b) providing a supersonic nozzle;

c) providing a first plurality of ceramic elements and a second plurality of ceramic elements, the ceramic elements releasably held together and positioned opposite the nozzle, with the first plurality of ceramic elements each having a ground electrode with a connector and the second plurality of ceramic elements each having a charge electrode with a connector;

d) directing a flow of a gas through the nozzle, the gas having a temperature of from 600 to 1200 degrees Fahrenheit; and

e) entraining the particles in the flow of the gas and accelerating the particles to a velocity sufficient to result in adherence of the particles to the ceramic elements upon impact, directing the accelerated particles at the connectors of the first plurality of ceramic elements forming a first band of adhered material electrically coupling the electrodes of the first plurality of ceramic elements together and directing the accelerated particles at the connectors of the second plurality of ceramic elements forming a second band of adhered material electrically coupling the electrodes of the second plurality of ceramic elements together, and the first and the second bands securing the ceramic elements together.

35. The method of claim 34, wherein step a) comprises providing particles having an average nominal diameter of from 60 to 106 microns.

36. The method of claim 34, wherein step b) comprises providing a nozzle having a throat with a diameter of from 1.5 to 3.0 millimeters.

37. The method of claim 34, wherein step a) comprises providing copper, a copper alloy, nickel, a nickel alloy, aluminum, an aluminum alloy, a stainless steel, and mixtures of these materials as the electrically conductive material.

38. The method of claim 34, wherein step e) comprises forming the first and the second bands to have a thickness of from 1 millimeter to 2.5 centimeters.

39. The method of claim 34, wherein step e) comprises directing the particles at the ceramic elements and connectors at an angle of from 0 to 45 degrees relative to a line drawn normal to the ceramic elements.

40. The method of claim 34, wherein step e) comprises directing the particles at the ceramic elements at an angle of from 15 to 25 degrees relative to a line drawn normal to the ceramic elements.

41. The method of claim 34, wherein step e) comprises moving one of the plurality ceramic elements or the nozzle past the other at a speed of from 0.5 to 13 centimeters per second.

42. The method of claim 34, wherein step e) comprises moving one of the plurality ceramic elements or the nozzle past the other at a speed of from 0.5 to 6.5 centimeters per second.

43. The method of claim 34, wherein step c) comprises positioning the plurality of ceramic elements opposite the nozzle at a distance of from 10 to 40 millimeters.

44. The method of claim 34, wherein step c) comprises positioning the plurality of ceramic elements opposite the nozzle at a distance of from 10 to 20 millimeters.

45. The method claim 34, further comprising after step e) the step of applying an outer layer over each of the bands, the outer layers comprising one of tantalum or ceramic.

46. The method of claim 34, further comprising in step e) the step of embedding one of an electrically conductive wire or an electrically conductive ribbon in said first and second bands.